ENSR

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August 9, 1989

Ms. Mary Kay Voytilla
U.S. Environmental Protection Agency
JFK Federal Building
Boston, MA 02203

Dear Ms. Voytilla:

As part of our work for W. R. Grace and Unifirst, ENSR collected long-term indoor air samples in the Grace and Unifirst buildings and three Woburn homes. The long-term passive monitors were exposed at fixed locations at each address for 45 to 52 days.

It is noteworthy that the long-term air concentrations are generally similar to the 8-hour concentrations measured by EPA and ENSR, reported earlier (see ENSR July 21, 1989 report). In many cases, the long-term concentration values are considerably lower than the corresponding 8-hour concentrations. Most notable is the long-term concentration of 1,1,1-trichloroethane in the basement of REDACTED , which was less than one-tenth of both the highest 8-hour measurements reported by ENSR and EPA (1.8 ppb long-term vs. 20 or 25 ppb short-term).

These findings indicate that the 8-hour measurements were conservative estimates of longer term exposures, and that, in general, long-term average indoor air concentrations appear to be roughly the same or lower. Furthermore, the relatively high 8-hour concentration of 1,1,1-trichloroethane measured at REDACTED appears to have been an unusual event, with the actual long-term concentration a factor of ten lower.

We are providing this information at our clients' request for your use in further understanding the air quality in the three residences. Please call should you have any questions regarding this report.

Very truly yours,

Arthur D. Schatz
Senior Air Quality Scientist

ADS/smq

Enclosure

cc: P. Kahn, EPA
E. Furlong, Massachusetts DPH
T. Conway, EPA
J. Spengler, Environmental Health and Engineering, Inc.
R. Jaeger, Environmental Medicine, Inc.
W. North, Decision Focus
M. Stoler, W. R. Grace
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July 26, 1989

Mr. Arthur D. Schatz
Senior Air Quality Scientist
ENSR CONSULTING AND ENGINEERING
35 Nagog Park
Acton, MA 01720

Clayton Project No. 24422.00

Dear Art:

Attached is our laboratory report on the analyses of the 3M Organic Vapor Monitors (OVM) that we received on June 22, 1989.

Tables 1 and 2 are the results of the speciated analysis of most of the compounds that you requested. As I told you on the phone, we were unable to resolve the methylene chloride and the trans-1,2-dichloroethylene from the solvent peak during the analysis.

Table 3 is the results of the total hydrocarbon measurements on the samples. The total hydrocarbon measurements are made according to the methodology attached.

We appreciate this opportunity to be of assistance to you. If you have any questions concerning this report, please contact me at (519) 255-9797.

Very truly yours,

Paul S. Epstein, Ph.D.
Director, Laboratory Services
Canadian Operations

Methodology for the analysis of OVM badges for volatile hydrocarbons.

1 - The absorbing pad of each OVM badge was rolled up and inserted into a 2.0 ml Wheaton autosampler vial.

2 - One ml. of CS_2 and 250 ng. of deuterated toluene (internal standard) was added to the vial. The vials were then sealed and placed on a reciprocating shaker for 45 minutes.

3 - Four hundred microliters of the sample was placed in a separate vial for total hydrocarbon analysis.

4 - The vials for target analysis were run with the GC/MS (HP 5890 GC coupled to HP 5970 Mass Selective Detector) in the selected ion monitoring (SIM) mode. The vials for total hydrocarbon analysis were analyzed with the instrument in the full scan mode. Instrument control was by an HP 1000 E-series computer running the RTE 6/VM operating system. Target analysis was carried out using the HP supplied Aquarius software.

5 - Before any samples were analyzed, a solvent blank was injected. A standard containing all the target compounds was run before each batch of 12 samples.

The GC/MS conditions were as follows:

Injection Port	300 ^{o}C
Oven Initial Temperature	40 ^{o}C
Oven Initial Time	9 min
Oven Program	5 ^{o}C/min
Oven Final Temperature	100 ^{o}C
Oven Final Hold	7 min
Injection Size	1 microliter
Splitless Injection	.75 min
GC Column	30m HP SE-54 FSCC
GC Carrier	Helium @ 2ml/min
Mass Range	SIM or full scan 35-260 amu
Multiplier Voltage	2500 SIM or 1700 full scan.

Amounts were calculated against the internal standard with response factors generated from a 5-point linearity set run before any samples were analyzed and updated from the daily midrange standard run before each set

of samples. The total hydrocarbon amounts were calculated by integrating the total chromatogram and using a 50 ng toluene standard to calculate total hydrocarbons as toluene.

Results were then corrected for desorption efficiencies generated from six replicate spikes at three different levels of the target compounds onto OVM badges or supplied by 3M. The total hydrocarbon numbers are not desorption corrected. After the desorption correction, the samples were blank corrected using the blank badges that travelled with the samples for blank correction values. This would compensate for both badge contamination and solvent problems. Blanks were corrected for desorption efficiency before the blank correction was applied.

Instrument limits of detection (LOD) were either the value of the low standard that was measurable or the average values of the blank badges, whichever was higher. Sample limits of detection were calculated using the desorption efficiency, the instrument LOD and the shortest sampling time of any of the samples.

TABLE 1
Results of Analyses of 3M Organic Vapor Monitors
for
ENSR

Clayton Project No. 24422.00

Lab Number		C38644	C38645	C38646	C38647	C38648	C38649	C38650
Sample Description		0219	0107	0267	0209	0158	0055	0343
Start Day		25-Apr-89	25-Apr-89	25-Apr-89	25-Apr-89	26-Apr-89	26-Apr-89	27-Apr-89
Finish Day		16-Jun-89	16-Jun-89	09-Jun-89	09-Jun-89	13-Jun-89	13-Jun-89	13-Jun-89
Sampling Time (min)		75180	75180	65460	69060	69060	69060	68100
	Limit of Detection	Concentration						
Target Compounds	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
Chloroform	0.374	0.43	0.86	0.79	1.00	0.51	0.55	0.70
1,1,1-Trichloroethane	0.584	2.58	2.46	21.20	7.72	15.90	9.85	2.82
Benzene	0.78	1.91	1.95	1.98	1.81	2.36	2.55	2.29
Trichloroethene	0.202	0.47	0.73	0.72	2.22	0.46	0.40	0.47
Toluene	0.707	7.26	6.81	15.20	17.80	34.20	16.50	18.90
Perchloroethylene	0.248	1.01	0.81	3.21	2.04	3.21	1.37	1.24
Ethyl Benzene	0.623	1.64	1.56	2.76	1.59	9.79	2.20	2.28
m,p-Xylene	0.229	5.55	5.40	7.81	4.84	34.70	8.18	7.73
Styrene	0.234	0.78	0.72	0.96	1.06	0.55	0.93	0.83
o-Xylene	0.229	2.05	1.95	3.02	1.78	11.50	3.13	2.89
Vinyl Chloride	0.306	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31

Analytical Method: Carbon Disulfide desorption
followed by Selected Ion
Monitoring GC/MS

Minus (-) = < LOD value

TABLE 1 (continued)
Results of Analyses of 3M Organic Vapor Monitors
for
ENSR

Clayton Project No. 24422.00

Lab Number		C38651	C38652	C38653	C38656	C38660	C38661
Sample Description		0307	8884	0157	8865	8950	8909
Start Day		27-Apr-89	27-Apr-89	27-Apr-89	28-Apr-89	27-Apr-89	27-Apr-89
Finish Day		13-Jun-89	13-Jun-89	13-Jun-89	16-Jun-89	16-Jun-89	16-Jun-89
Sampling Time (min)		68100	68100	68100	70860	71760	71760
	Limit of Detection	Concentration					
Target Compounds	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
Chloroform	0.374	0.55	0.58	0.54	-0.37	-0.37	1.77
1,1,1-Trichloroethane	0.584	5.65	3.82	4.02	1.86	6.01	11.10
Benzene	0.78	5.84	1.38	1.35	1.15	1.59	2.18
Trichloroethene	0.202	0.56	0.45	1.17	0.64	1.05	1.64
Toluene	0.707	36.10	15.40	15.90	4.41	6.73	6.77
Perchloroethylene	0.248	2.65	2.01	2.27	0.79	63.20	209.00
Ethyl Benzene	0.623	5.60	2.51	2.58	0.77	1.59	1.80
m,p-Xylene	0.229	18.60	8.13	8.12	2.72	6.25	7.77
Styrene	0.234	0.42	0.90	0.90	0.69	1.02	1.16
o-Xylene	0.229	6.96	2.62	2.72	1.03	3.33	4.59
Vinyl Chloride	0.306	-0.31	-0.31	-0.31	-0.31	-0.31	-0.31

Analytical Method: Carbon Disulfide desorption
followed by Selected Ion
Monitoring GC/MS

Minus (-) = < LOD value

TABLE 2
Results of Analyses of 3M Organic Vapor Monitors
for
ENSR

Clayton Project No. 24422.00 REDACTED

REDACTED

		— Outdoor —					
		UF Window	UF Fence SW	B	U	U	B	U
Lab Number	C38644	C38645	C38646	C38647	C38648	C38649	C38650
Sample Description	0219	0107	0267	0209	0158	0055	0343
Start Day	25-Apr-89	25-Apr-89	25-Apr-89	25-Apr-89	26-Apr-89	26-Apr-89	27-Apr-89
Finish Day	16-Jun-89	16-Jun-89	09-Jun-89	09-Jun-89	13-Jun-89	13-Jun-89	13-Jun-89
Sampling Time (min)	75180	75180	65460	69060	69060	69060	68100

Target Compounds	Limit of Detection (PPB)	Concentration (PPB)	(PPB)	(PPB)	(PPB)	(PPB)	(PPB)	(PPB)
Chloroform	0.0768	0.09	0.18	0.16	0.21	0.11	0.11	0.14
1,1,1–Trichloroethane	0.107	0.47	0.45	3.89	1.42	2.92	1.81	0.52
Benzene	0.244	0.60	0.61	0.62	0.57	0.74	0.80	0.72
Trichloroethene	0.0376	0.09	0.14	0.13	0.41	0.09	0.07	0.09
Toluene	0.188	1.93	1.81	4.05	4.73	9.11	4.39	5.02
Perchloroethylene	0.0365	0.15	0.12	0.47	0.30	0.47	0.20	0.18
Ethyl Benzene	0.144	0.38	0.36	0.64	0.37	2.26	0.51	0.53
m,p–Xylene	0.0529	1.28	1.25	1.80	1.12	8.02	1.89	1.79
Styrene	0.0424	0.14	0.13	0.17	0.19	0.10	0.17	0.15
o–Xylene	0.0529	0.47	0.45	0.70	0.41	2.65	0.72	0.67
Vinyl Chloride	0.12	–0.12	–0.12	–0.12	–0.12	–0.12	–0.12	–0.12

Analytical Method: Carbon Disulfide desorption
followed by Selected Ion
Monitoring GC/MS

Minus (–) = < LOD value

TABLE 2 (continued)
Results of Analyses of 3M Organic Vapor Monitors
for
ENSR

Clayton Project No. 24422.00

REDACTED

Unitirst Bldg.

	TV Room (upstairs)	B	B collocated	Outdoor G4	U1	U2
Lab Number	C38651	C38652	C38653	C38656	C38660	C38661
Sample Description	0307	8884	0157	8865	8950	8909
Start Day	27-Apr-89	27-Apr-89	27-Apr-89	28-Apr-89	27-Apr-89	27-Apr-89
Finish Day	13-Jun-89	13-Jun-89	13-Jun-89	16-Jun-89	16-Jun-89	16-Jun-89
Sampling Time (min)	68100	68100	68100	70860	71760	71760

Target Compounds	Limit of Detection (PPB)	Concentration (PPB)	(PPB)	(PPB)	(PPB)	(PPB)	(PPB)
Chloroform	0.0768	0.11	0.12	0.11	–0.08	–0.08	0.36
1,1,1–Trichloroethane	0.107	1.04	0.70	0.74	0.34	1.10	2.04
Benzene	0.244	1.83	0.43	0.42	0.36	0.50	0.68
Trichloroethene	0.0376	0.11	0.08	0.22	0.12	0.20	0.31
Toluene	0.188	9.61	4.09	4.22	1.17	1.79	1.80
Perchloroethylene	0.0365	0.39	0.30	0.33	0.12	9.30	30.80
Ethyl Benzene	0.144	1.29	0.58	0.60	0.18	0.37	0.42
m,p–Xylene	0.0529	4.30	1.88	1.88	0.63	1.44	1.79
Styrene	0.0424	0.08	0.16	0.16	0.13	0.19	0.21
o–Xylene	0.0529	1.61	0.61	0.63	0.24	0.77	1.06
Vinyl Chloride	0.12	–0.12	–0.12	–0.12	–0.12	–0.12	–0.12

Analytical Method: Carbon Disulfide desorption
followed by Selected Ion
Monitoring GC/MS

Minus (–) = < LOD value

TABLE 3
Results of Analyses of 3M Organic Vapor Monitors
for
ENSR

Clayton Project No. 24422.00

Total Hydrocarbons as Toluene						
Lab Number	Sample Id.	Start Date	Finish date	Time (min)	ug	(ug/m3) as Toluene
C38644	0219	25-Apr-89	16-Jun-89	75180	74.72	31.6
C38645	0107	25-Apr-89	16-Jun-89	75180	89.21	37.7
C38646	0267	25-Apr-89	09-Jun-89	65460	531.73	258
C38647	0209	25-Apr-89	09-Jun-89	65460	303.37	147
C38648	0158	26-Apr-89	13-Jun-89	69060	1413.05	651
C38649	0055	26-Apr-89	13-Jun-89	69060	763.34	351
C38650	0343	27-Apr-89	13-Jun-89	68100	321.41	150
C38651	0307	27-Apr-89	13-Jun-89	68100	236.33	110
C38652	8884	27-Apr-89	13-Jun-89	68100	217.00	101
C38653	0157	27-Apr-89	13-Jun-89	68100	228.42	107
C38656	8865	27-Apr-89	13-Jun-89	71760	35.68	15.8
C38660	8950	27-Apr-89	16-Jun-89	70860	237.70	107
C34842	8909	27-Apr-89	16-Jun-89	70860	356.85	160